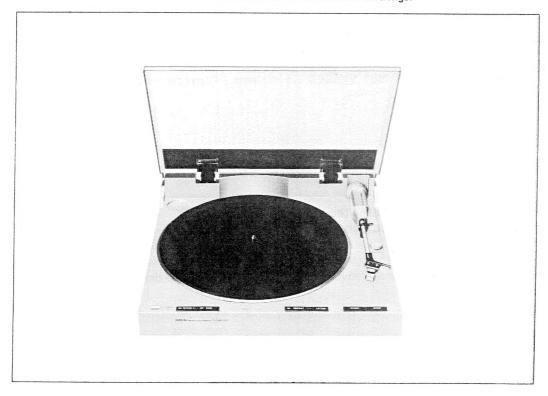
DENON

SERVICE MANUAL

FULLY AUTOMATIC DIRECT DRIVE TURNTABLE SYSTEM

MODEL DP-11F SERIES

U.S. and Canadian models do not include cartridge.



NIPPON COLUMBIA CO., LTD.

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WARNING:

1. Component parts

Parts marked with \triangle and/or shading in this service manual have special characteristics important to safety. Be sure to use the specified parts for replacement.

2. Leakage current

Before returning the appliance to customer, test the leakage current when the power plug is connected. Use a calibrated (with an error of not more than 5%) leakage current tester and measure the leakage current from any exposed metal to the earth ground. Reverse the power plug polarity and test the above again.

Any current measured MUST NOT EXCEED 0.5 miliamps. Corrective measure must be taken if it exceeds the limit.

FEATURES

Silent, fully automatic operations with the use of a microprocessor controlled contactless servo tonearm.

An innovative microprocessor controlled, contactless servo tonearm ensures safe, easy to use automatic operations with little loss in sound quality.

Low mass straight arm

This arm is fully capable of maximizing the performance of high compliance cartridges with outstanding tracing ability. Even with the newest, high grade records, its tracing ability is outstanding.

DENON Quartz

The turntable speed is controlled by the "DENON Quartz" which is the combination of the "High Precision Magnetic Pulse Detection Method", the most sophisticated method of FG detection, and the "Quartz Lock".

SPECIFICATIONS

Phonomotor section

Drive system: Servo controlled direct drive

Turntable speeds: 33-1/3, 45 rpm

Wow & flutter: Below 0.02% wrms (servo system)

Below 0.03% wrms (JIS)

S/N ratio: Over 75 dB (DIN-B)

Rise time: Normal speed within 2 seconds (at 33-1/3 rpm)

Platter: Aluminum die-cast; 300 mm diameter

Motor: Linear drive motor

Speed control system: Speed servo by frequency detection, phase servo control

Speed deviation: Below 0.002%

Load characteristics: 0% (80 g stylus force; outermost groove)

General

Power supply: 50~60 Hz, Voltage is shown on rating label

Power consumption: 7 V

Dimensions: 100 x 365 x 335 mm (H x W x D)

Weight: Approximately 5 kg

Tonearm section

Arm type: Dynamically balance, semi-integrated straight arm

Effective length: 220 mm
Overhang: 16 mm

Tracking error: Within 3°

Automatic mechanism: Electronically controlled, fully automatic

Adjustable stylus force range: $0\sim3.0 \text{ g} \text{ (1 scale}=0.1 \text{ g)}$

Suitable cartridge weight range: Approximately 4.0~6.0 g (including screws, nuts)

Cartridge section (Only for those models with attached cartridge)

DL-60

Type: Moving magnet (MM)

Output voltage: 2.5 mV
Frequency response: 20~30 kHz

Stylus force: 1.8±0.3 g

Above specifications and outward appearance may be altered in future for improvement.

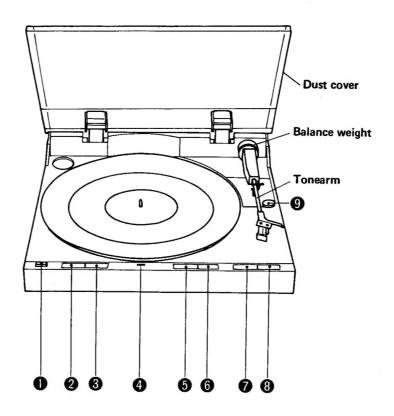
U.S. and Canadian models do not include cartridge.

BLOCK DIAGRAM

Rotational speed detection Lock indication Rotation Power Reference voltage control amplifier **Phonomotor** F/V output Magnetic polarity Compare/ Motor_control detection Amplify microprocessor Memorize IR3T02 Magnetic polarity Speed selector P.D. output detection (33/45)Stop control Power amplifier Rotation control Xtal 4.5MHz Start/stop command Lifter o Stylus force Memorize adjustment Repeat o Speed detection Arm up/down command Memorize Vertical motor (Lifter motor) Start o Power Compare/ amplifier Stop o amplify Reference voltage 17/30 Position Accelaration detection input Arm control Size selector (30/17) microprocessor **IR3T03** Compare/ amplify Accelaration output Memorize Compare/ Rest/end detection amplify Horizontal voltage killer Anti skate command End Mid-point detection detection Amplify Anti skate voltage Reference voltage Compare/ amplify Horizontal motor S Power amplifier Speed detection

Note: indicates an analog switch.

PART NAMES AND FUNCTION



1 POWER (Power switch)

This switch turns the power supply on (—) and off (—). When turning the power off, always return the tonearm to the arm rest and hold it in place with the clamp.

2 SIZE (Record size selector switch)

Set to the size of record to be played.

3 SPEED (Speed selector switch)

Set to the desired record speed.

(4) LOCK (Lock indicator)

When the power is turned on, the lamp will light up. During play, the lamp will flicker until the proper turntable speed is reached. Once the proper speed is obtained, the lamp will, again, stay lit.

(5) REPEAT (Repeat switch)

When playing the records repeatedly, switch it on (lamp lit).

6 ARM LIFTER (Arm lifter switch)

This switch is used to raise and lower the arm during play or when playing the records manually. The lamp is lit when arm is up.

(7) START (Start switch)

Press this switch when starting the records automatically.

8 STOP (Stop switch)

Press this switch when stopping the record during play.

(9) STYLUS FORCE (Stylus force adjustment knob)

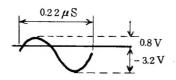
This knob is used to adjust the stylus force.

EXPLANATION OF THE MICROPROCESSOR

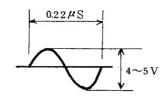
Motor Control IC . . . IR3T02 (at standard revolution of 33 rpm)

The numbers on the left hand side indicates the terminal number.

2. 4.5MHz OSC



3. 4.5MHz OSC



4. rpm selector

H: 45 rpm L: 33 rpm

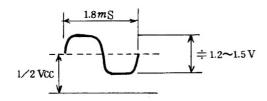
5. power source input

Vcc: 5V ±0.5V

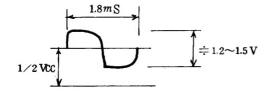
6. FG I bypass terminal

E6 ≒ ½Vcc

7. FG I lowpass terminal



8. FG I output



9. FG I inverse input

The gain set element is connected. E9 ≒ ½Vcc

10. FG I non-inverse input

10mVpp ~ 100mVpp E10 ≒ ½Vcc

14. ground terminal

15. F/V output

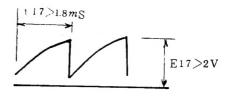
slower than normal revolution: 2 ~ 4.5V normal revolution: ≒ 2V faster than normal revolution: 0 ~ 2V

16. F/V hold terminal

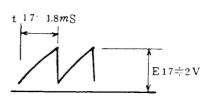
same as terminal 15

17. F/V triangular wave

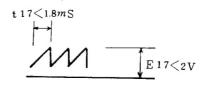
slower than normal revolution



normal revolution



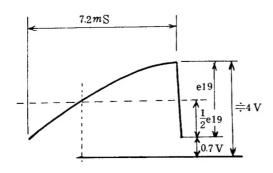
faster than normal revolution



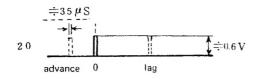
18, timing pulse width-set terminal

E18 ≒ 0.6V

19. PD triangular wave



20. sample pulse monitor terminal



21 PD hold terminal

slow phase: $2 \sim 4V$ normal phase: = 2Vadvanced phase: $1 \sim 3V$

22. PD output

same as terminal 21

23. Lock detector time set terminal

during lock: 0.6V lock disengaged: 0V

25. Revolution detector

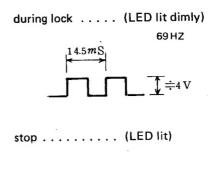
during revolution: _______ = 4V

stop: 0V

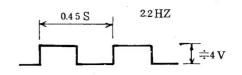
26. START/STOP terminal

H → START L → STOP

28. Lock indicator



during transition . . (LED flashes)



Arm Control IC IR3T03

The numbers on the left side indicates the terminal number of the IR3T03.

1. Accelaration input

Except for the matching range of the lead-in detector (E7 \leq | \pm 0.6V |), it will recognize the situation and control the acceleration during automatic tonearm operation.

2. Accelaration output

E1 \leq | ± 2.37 V ± 0.1 V | open (will not control the acceleration within the matching range)

 $E1 \ge |\pm 2.3 \lor \pm 0.1 \lor |$ $E2 = \pm 3.95 \lor$

-3.95V: will accelarate toward the inside from rest. +3.95V: will accelarate toward rest from the inside.

3. UP/DOWN selection of the arm lifter

When E9 is H, the control output for lifting the arm will be made at E3 $\stackrel{.}{=}$ -Vcc.

When E9 is L, the control output for lowering the arm will be made at E3 = +Vcc.

4. Detection of the rest position

E4 \leq -2.64V will be recognized as the arm being at rest.

5. Detection of the END position

When E5 \geq 2.64V, it will be recognized to be within the END detection range.

E5 \geq 2.64V when the stylus tip nears the last sections of the sound groove.

6. End control

Whithin the END detection range of 5 (above), (E5 \geq 2.64V), the arm will be returned by the END control when E6 \geq 0.23V.

E5 \geq 0.23V when the stylus tip moves into the lead-out groove and the arm moves fast.

7. Matching input

E7 \leq | ±0.6V | will be recognized as the match range for lead-in.

8. Drive output

Connect to GND.

9. UP control output

When the lifter is in the UP position during automatic arm operations or when the UP signal is sent by pressing the arm lifter button, pin 9 will be at H level.

E9H = 4V

E9L≒0V

10. DOWN time constant

To ensure that the arm is lowered completely before proceeding to the next movement, a resistor between pins 9 and 10 and a capacitor on pin 10 has a preset discharge time constant which is somewhat longer than the time required for the arm to be lowered. Thus, when pin 9 becomes L (E9L $\stackrel{.}{=}$ 0V), and the fixed amount of time elapses, the arm will be recognized to be DOWN as soon as E10 < 2V.

11. ANT (Anti-skating) control

When E10 < 2V, then E11 = -4V will be the control output needed for the anti-skating to be engaged.

When E10 \geq 2V, then E11 = +4V will be the control output needed for the anti-skating to be disengaged.

12. Negative power source

Supplies -5V.

14. SUB (substratum)

To prevent any interference from the inner elements of the LSI, the substratum terminal is connected to the unregulated side of the negative power source, since it has the lowest electric potential.

15. GND

Standard zero electric potential is the GND.

17. Return control

When the stop command is given, or when the repeat is disengaged and the END is detected (E6 \ge 0.23V), a control signal output (E17H > 4V) is made to return the arm to rest.

E17H > 4V

E17L: release

18. Horizontal drive control

When the arm is in resting position, or when the arm reaches the lead-in position during automatic play, and comes into the matching range (E7 \leq | \pm 0.6V |), a control signal output (E18H \doteq 4V) is made to stop the horizontal motion of the arm.

19. Initial set

This is the preparation time setting terminal when the power source is turned on. The resistor in the LSI and the outer capacitor will set the charge time constant and carry out the initial set.

20. LCTD (Located) time constant

The LSI and its outer circuits will set the LCTD time constant to improve the detection accuracy of the lead-in position and the arm rest position.

E20H = 1.2V A few moments after the arm reaches the range of detection, in other words, after the set LCTD time constant elapses, it will become H level, where it is memorized immediately and then reset to the L level.

E20L = 0V Before and after detection, it will become L level.

21. Turntable (T/T) Drive Control

E21L = 0V the turntable stops
E21H release the turntable rotates
(refer to the operational explanations for pin 22)

22. Turntable (T/T) Start Position

This terminal establishes the turntable start position. The turntable will start when the arm separates from the arm rest and pin 22 is released, under manual and auto modes.

23. Start

Will start automatically at the GND level.

24. Auto stop

Will stop automatically at the GND level.

25. Lifter

Will raise the lifter automatically at the GND level.

26. Repeat

Will engage the repeat automatically at the GND level.

27. UP SW

An UP time constant circuit is used so that when the lifter is in the UP condition, this terminal is released and becomes H level; and at other times, it becomes GND level. With this unit, the arm will start to move approximately two seconds after the UP command.

28. Positive power supply

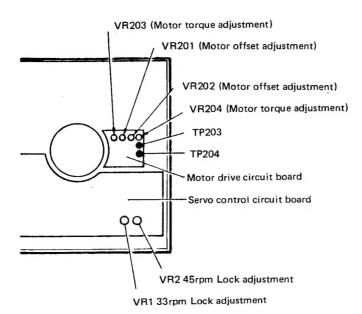
Supplies +5V.

ADJUSTMENT METHOD

* Prepare a two-channel oscilloscope for the measuring instrument,

Adjusting the Phonomotor Section

* Measure, using the wrapping terminal number 8 of the motor drive circuit board as the ground referent point when adjusting the motor OP amp. voltage offset and the motor torque.



1. Adjusting the motor amp. offset voltage

- 1) Fix the tonearm to the arm rest and connect the oscilloscope to TP 203 and 204.
- 2) Rotating the turntable by hand, adjust the center of amplitude at TP 203 to 0 \pm 0.1V by turning VR 201 .
- 3) Following the preceding directions adjust to 0 \pm 0.1V by turning VR 202 for TP 204 .

2. Adjusting the motor torque

- Leave the oscilloscope connections as they were for the motor OP amp. voltage offset adjustments.
- Take the turntable off the main body; move the tonearm close to the speed detection head and rotate the phonomotor at a fast speed.

(Note) Be very cautious as not to damage the cartridge during this procedure.

- 3) For T.P. 203 , rotate VR 203 and adjust to $15VP-P\pm0.5V$.
- 4) For T.P. 204 , rotate VR 204 and adjust to $15VP-P\pm0.5V$.



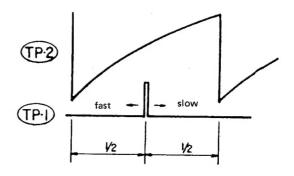
3. Adjusting the head gap

Adjust, so that the gap between the turntable magnetic coating surface and the detection head is 0.18 mm.

4. Lock adjustments for 45 rpm

From hereafter, the earth reference point of the measuring instrument should be connected to T.P. 6 of the servo control circuit board.

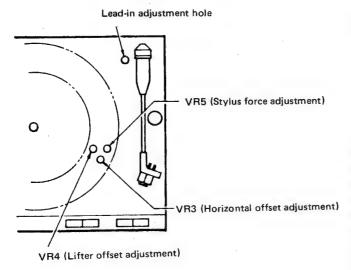
- Connect the two-channel oscilloscope to T.P. 1 and T.P. 2.
- 2) Set the speed selector to 45 rpm.
- Take the arm off the arm rest and move it toward the turntable to rotate the phonomotor.
- 4) Adjust VR2 so that the pulse from T.P. 1 is positioned to ½ the triangular wave length from T.P. 2.



5. Lock adjustments for 33 rpm

- Connect the oscilloscope in the same manner as the 45 rpm lock adjustments. Set the speed selector to 33 rpm.
- Adjust VR1 in the same manner as the lock adjustments for 45 rpm.

Adjusting the Arm Control Section



1. Adjusting the horizontal OP amp. offset voltage

- 1) Fix the tonearm to the armrest and connect the oscilloscope to T.P. 3.
- 2) Set the lifter switch to the UP condition.
- Turn VR3 and adjust to 0V±0.01V.

2. Adjusting the lifter OP amp. offset voltage

- Fix the tonearm to the armrest and connect the oscilloscope to T.P. 4.
- 2) Set the lifter switch to the DOWN condition.
- 3) Turn VR4 and adjust to -1V±0.1V.

3. Adjusting the stylus force

- 1) Turn the power supply switch OFF.
- Take the arm off the armrest. Rotate the balance weight so that the tonearm becomes parallel to the turntable surface when let go.
- Return the arm to the armrest and turn the power supply switch ON.
- 4) Wait five seconds after the arm has lowered. Place the cartridge stylus tip onto a stylus force guage and set the stylus force adjustment knob to 1.5 g.
 - (Note) At this time, the stylus tip height should be adjusted so that it is about the same height as during play.
- Turn VR5 and adjust, so that the stylus force guage reads 1.5 g.

4. Adjusting the 30 cm lead-in position

Place a 30 cm record on the turntable and set the record size selector switch to "30".
 (Note) Keep the bottom cover closed.

- 2) Move the arm so that the stylus tip is at approximately the 30 cm lead-in position. Insert a small flat-headed screwdriver into the lead-in adjustment hole; move the arm back and forth and fit the screw driver into the groove of the cam inside gently.
- 3) After turning the screwdriver, pull it out. Press the start switch and adjust so that the stylus position stops at the 30 cm lead-in position.

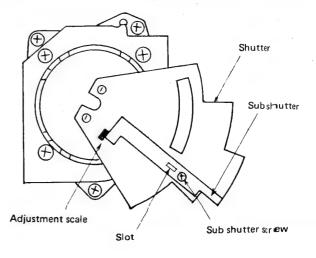
(Note) The 30 cm lead-in adjustments cannot be performed unless the stylus tip position is approximately in the 30 cm lead-in position. In addition, if the screwdriver is left inserted, the arm will not move.

5. Adjusting the 17 cm lead-in position

Adjust as necessary, such as when parts of the sensor section have been replaced.

However, the following procedures should only be used when a discrepancy is found for the 17 cm lead-in position, after the 30 cm lead-in position has been adjusted.

- 1) Set the record size selector to 17 cm.
- 2) By continuously pressing the start switch, the arm will move over and stop. At this time, check now many millimeters, toward the inside or outside, the stylus tip deviates from the required 17 cm lead-in position.
- 3) Take off the bottom cover of the cabinet and check the adjustment scale position of the shutter. (One adjustment scale corresponds to a stylus tip movement of 5 mm.)
- 4) Untighten the screw holding the sub shutter and place a small screwdriver into the slot of the shutter. When the stylus position is toward the inside, compared to the required position, move the sub shutter toward the right of the scale; when the stylus position is toward the outside, move the sub shutter toward the left. When completed, tentatively tighten the screw holding the sub shutter.
- 5) After the adjustments are made, press the start switch and check whether or not the stylus stops at the 17 cm lead-in position.
- If the stylus stops at the required position, then tighten the sub shutter screw.



PARTS LIST OF EXPLODED VIEW

Ref. No.	Part No.	Part Name	Remarks
1	4730306012	3x12 CBRTS (1)	
2	4751005004	4W	
3	1048066018	INSULATOR ASS'Y	
4	4730306038	3x12 CBRTS (1)	
5	1058083104	BOTTOM COVER ASS'Y	
6	4218217209	RECORDED TURN TABLE	
7	4218288005	RUBBER SHEET	
8	4628023009	BUSHING	į
9	5298006002	45 ADAPTOR	
10	1468137103	DUST COVER ASS'Y	
11	4018059007	HINGE	
12		INCLUDED SCREW	
13	3158545113	ARM REST	
14	3138003109	CARTRIDGE GENE ASS'Y	E1,EF,EG,EA, EK,E1
15	3158705005	MAIN BODY ASS'Y	
16	2098251005	TERMINAL WIRE	
17	4618113000	SPRING PLATE	
18	2228468008	OUTPUT P.C.B	
19	4712303017	3x6 CFS	
20	4638225004	SPRING	
21	4711303018	3x6 CPS	
22	4751003006	3W	
23	4438545104	COLLAR	
24	4338172004	SUB SHUTTER	
25	4338177300	SHUTTER	
26	4761003009	3E RING	
27	3158451003	FRICTION WASHER	
28	3418025205	MAGNET ASS'Y	
29	2398013105	COJL ASS'Y	
30	4338181008	YOKE (A) GENE ASS'Y	
31	4744102037	3x3 SS	
32	4248019105	ADJUST CAM	
33	4418815003	ARM PLATE	
34	4698008009	INSULATER MAT	
35	2228468008	CDS P.C.B	
36	4730304014	3x8 CBRTS (1)	
37	3939041001	LED	LN81RCP (HL)
38	2228468008	LED P.C.B	
39	4713808003	3×25 CBS	BsBW, MBNi II
40	4713806003	3×20 CPTS (1)	SUS305
41	2178062101	MOTOR ASS'Y	
42	4730309019	3×16 CBRTS (1)	
43	WA-0107-4	WASHER	
44	4620027003	RUBBER BUSH	
45	2339051003	POWER TRANS	
	2339058006	POWER TRANS	E1 only
]	2339050101	POWER TRANS	EU only
40	4418846001	WASHER	
47	4418814208	HEAD SUPPORT	
48	3918423006	MAGNETIC HEAD	
49	4700009019	3x6 CPSW	
50	2228468008	VOLUME HOLDER P.C.B	
51	2118024002	V16V15KB502	
52	1128085003	VOLUME KNOB	
58	2033642103	OUTPUT CORD ASS'Y	F0 FF F0
59	2062002031	AC CORD	E2, EF, EG
	2006019307	AS 3P AC CORD	EA
	2062024006	AC CORD WITH LABEL	EK
	2006031026	AC CORD WITH PLUG	E1
	2062019008	AC CORD WITH PLUG	EU

Ref. No.	Part No.	Part Name	Remarks
63	1038196406	CABINET	
	1038196422	CABINET	E1 only
64	2228468008	LED P.C.B	
65	3939140009	LED	GL-9PG24
66	2129130008	PUSH SWITCH	
67	3939153009	LED	PR-5524S-1
68	1138140103	STOP KNOB	
69	1138139101	START KNOB	
70	1138138102	LIFTER KNOB	
71	1138137103	REPEAT KNOB	
72	1138135105	SPEED KNOB	
73	1138136104	SIZE KNOB	
74	4730205016	2.6×10 CPTS (1)	
75	2129180003	PUSH SWITCH	
76	1138134009	KNOB	
77	KU-0419	SERVO CONTROL UNIT	
78	3168198000	CONNECTOR	
79	3158693104	BODY CASE	
80	3158695005	BALANCE WEIGHT	
81	3158709001	ADJUST SCREW	
82	2129185008	SLIDE SWITCH	E1 only
83	KU-0420	MOTOR DRIVE UNIT	

Remark symbols in the parts list refer to the following countries and areas.

EA: Australia EK: United Kingdom

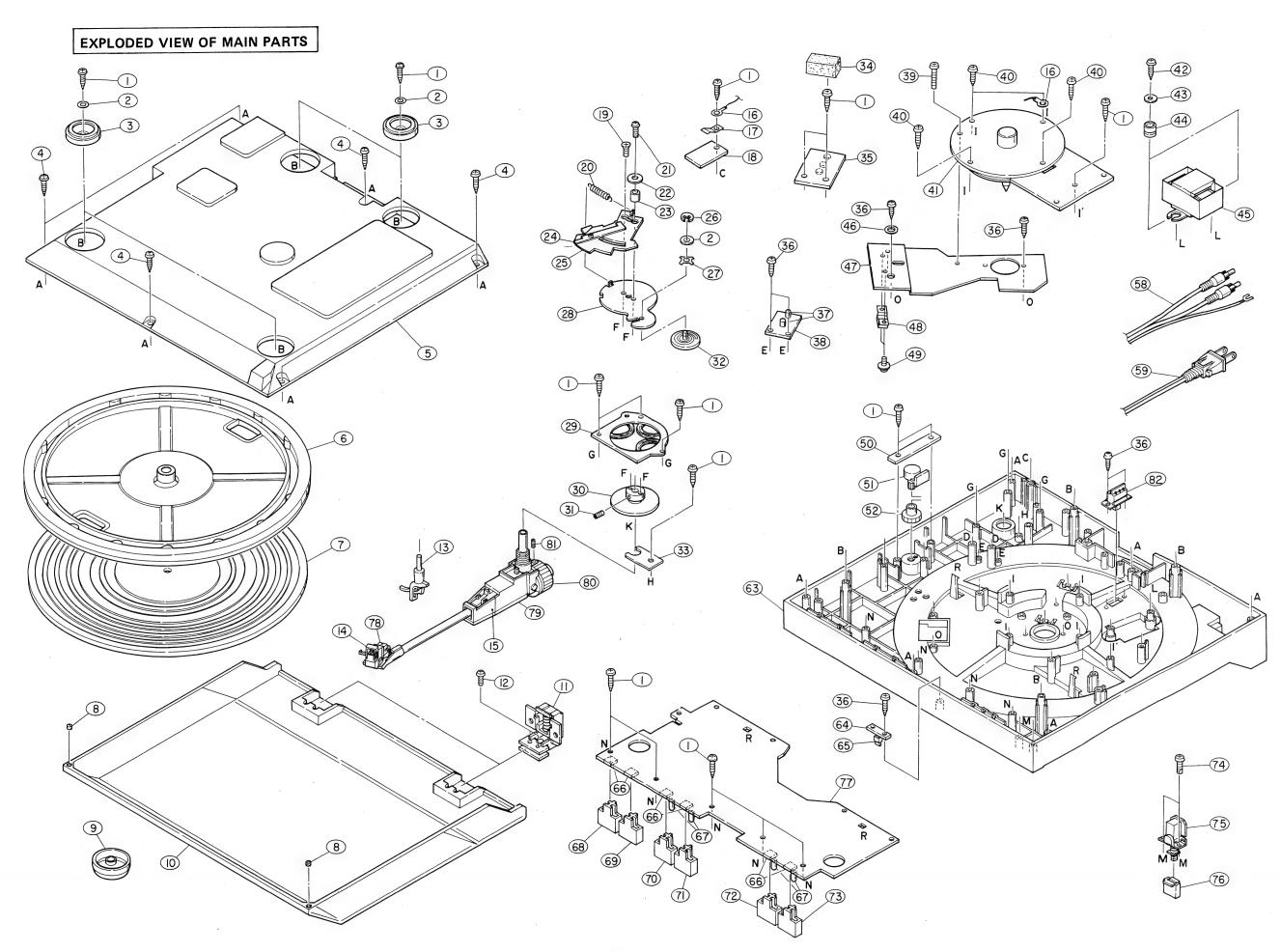
EU: U.S.A. and Canada

E1: Multiple voltage model

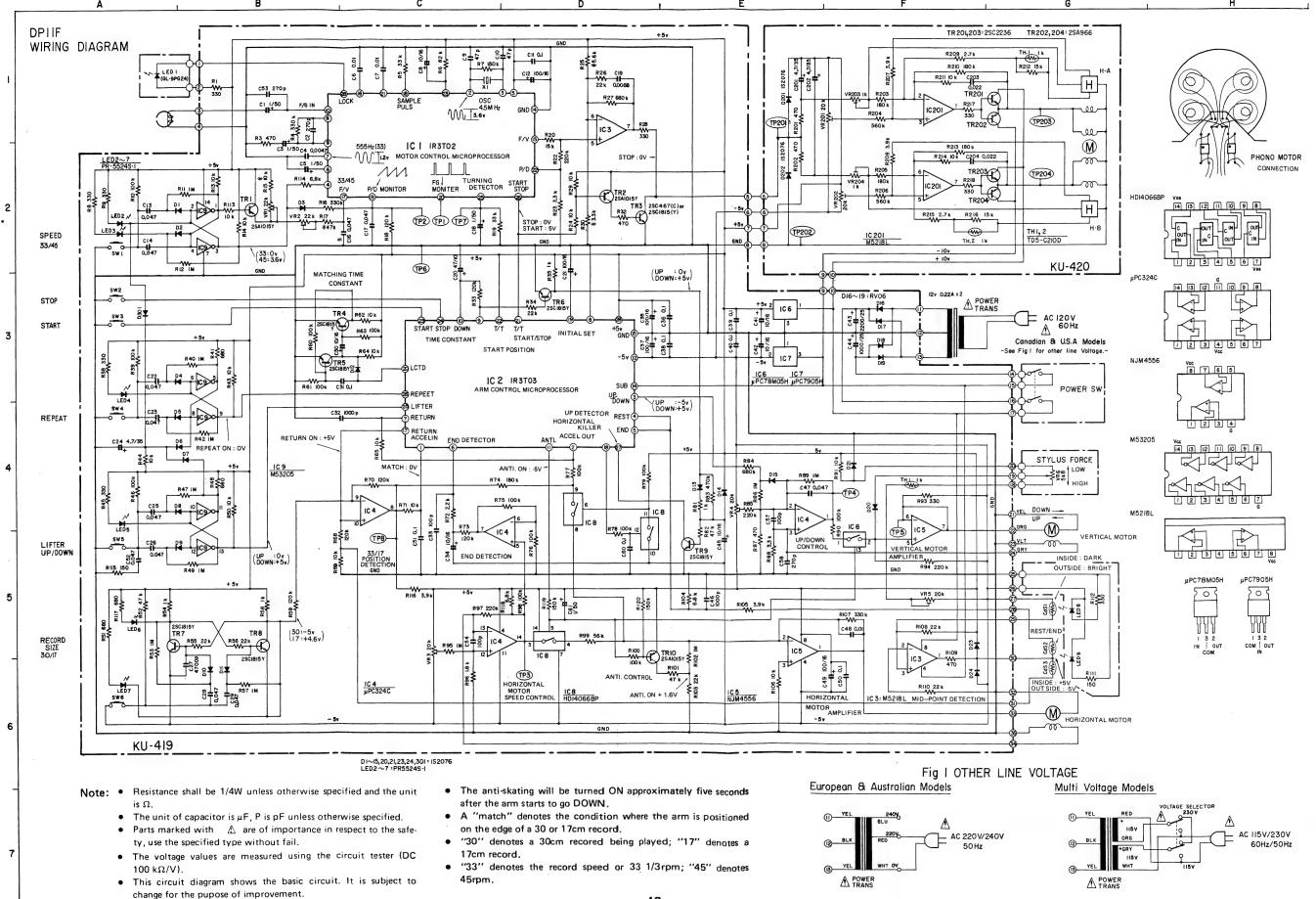
E2: European continent

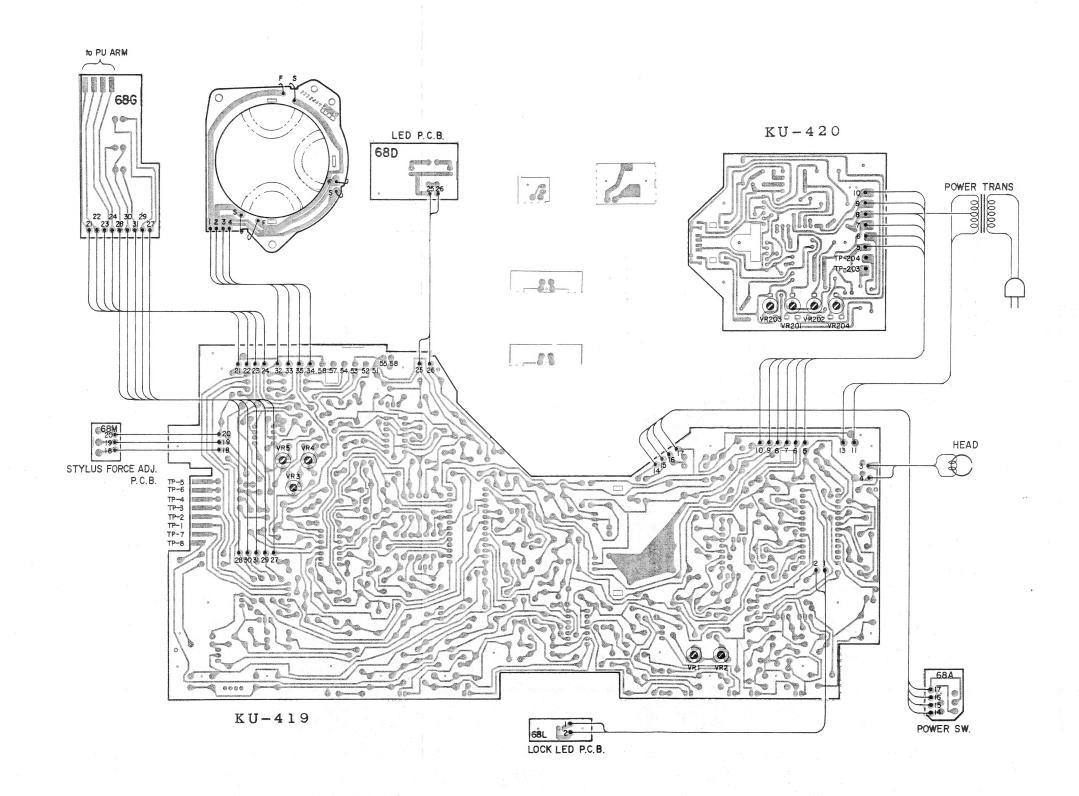
EF: French

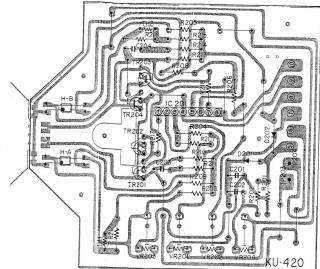
EG: German



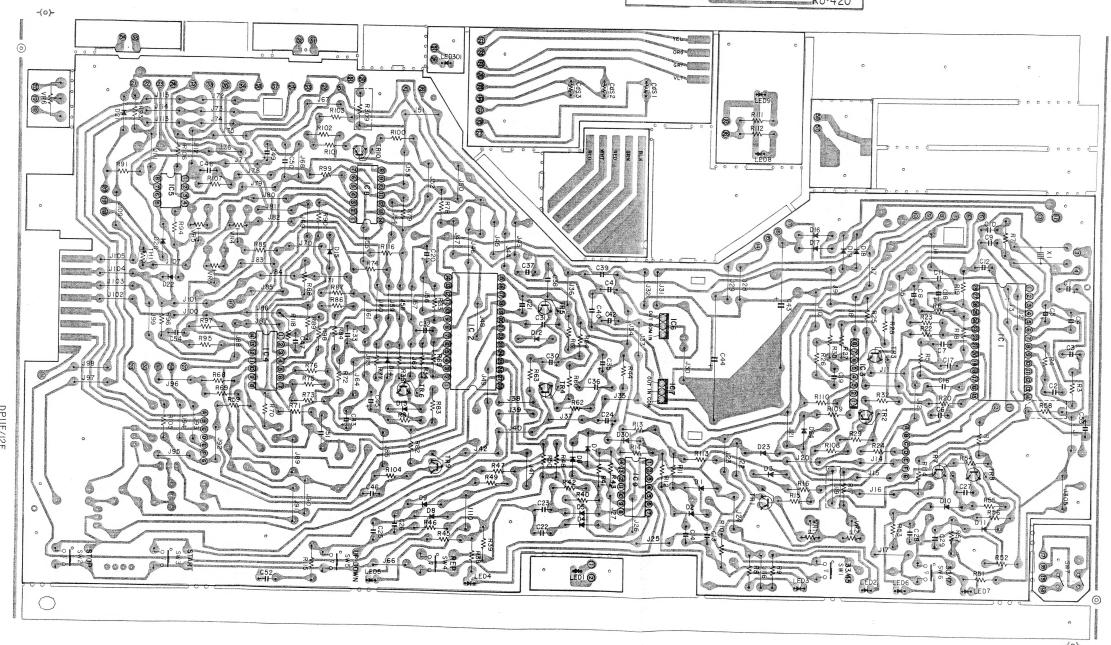
SCHEMATIC DIAGRAM







KU-419 SERVO CONTROL UNIT



PARTS LIST OF P. C. BOARD

KU-419 SERVO CONTROL UNIT

SEMICONDUCTOR GROUP	Ref. No.	Part No.	Part Name	Remarks		
IC1			Tartivanie	Tomaria		
IC2						
IC3						
IC4						
IC5						
IC6	1		•			
IC7	1					
ICS						
IC9	1					
TRA~9 TR3 D1~15, 20 2740038000 D1~15, 20 21, 23, 24, 301 D16~19 TH1 2760237001 TH1 2760237001 TH1 2760231008 THERMISTER LED1 3939140009 LED LED2~7 3939043001 CDS1, 2 3939053002 CDS RESISTOR GROUP R30 R25 24522195008 R15 2452207006 R15 2452223006 R17 2452223006 R17 VR1, 2 EP-5462H15 VR3~5 2116000073 VR6 2118024002 V16V15KB502 CAPACITOR GROUP C33, 54 C27 C32, 46 C27 C32, 46 C32, 46 C27 C533657009 C44 C11, 31, 36, 38~40, 50, 51, 60 C9, 10 C58 2533657009 CC45SL1H101K C20 C20 C8, 30, 41, 42, 45, 34 C12, 21, 35, 37, 49 C44 C43 C24 C44 C43 C2544038004 CR1 CEOWHIC10= C8, 30, 41, 42, 45, 34 C12, 21, 35, 37, 49 C44 C43 C24 C24 C25410000 CEOWHIC10= C8, 30, 41, 42, 45, 34 C12, 21, 35, 37, 49 C44 C43 C2542038004 CC49W1C10= C68 C24 C2544044009 CEOWHIC10= CEOWHIC101= CEOWHIC1		2620092001	M53205P			
TR4~9	TR1,2,10	2710102005	2SA1015 (Y)			
D1-15, 20		2730198002	2SC1815 (Y)			
21,23,24, 301 D16~19 D16~10 D16~19 D16~10 D	TR3	2740038000	2SD467 (C)			
301	D1~15, 20	2760049008	IS2076			
D16~19	21,23,24,					
TH1						
LED1 3939140009 LED GL-9PG24 PR-55245-1 LN81RCP(HL)				TDE 0210D		
LED2~7 3939153009 LED PR-5524S-1 LN81RCP(HL) CDS1,2 3939053001 CDS 3939053028 CDS 10~15KΩ RESISTOR GROUP R30 2452195008 RN14K2E332G SAKΩ ¼W R15 2452207006 RN14K2E103G RN14K2E103G RN14K2E473G YAFΩ ¼W Variable resistor VR1,2 EP-5462H15 VOSPB203 Y16V15KB502 EACH CK45B1H101K CK45B1H472K CK45B1H472K CK45B1H472K CK45B1H472K CK45B1H472K CK45B1H472K CK45B1H472K CX45B1H472K CX45B1H472K CX45B1H472K CX45B1H472K CX45B1H472K CX45B1H472K CX45B1H472K CX5 2533657009 CK45B1H470J CC5 2533662007 CC45SL1H470J CC5 25336637003 CC45SL1H470J CC5 2533637003 CC45SL1H470J CC5 25336637003 CC45SL1H470J CC5 2533637003 CC45SL1H470J CC5 2533637003 CC45SL1H271J 270PF 50V CC45 2533637003 CC45SL1H271J 270PF 50V CC45 2533637003 CC45SL1H271J 270PF 50V Electrolitic A2,45,34 C12,21, 2544132005 CE04W1C10= 100µF 16V 10µF 10µF 16V 10µF 10µF 10V						
LED8,9 3939041001 CDS 1,2 3939053001 CDS 1,2 3939053001 CDS 10~15KΩ RESISTOR GROUP R30 2452195008 RN14K2E332G R15 2452201002 R15 245222006 RN14K2E103G H16KΩ ½W Variable resistor 22KΩ VR3~5 2116000073 V08PB203 V16V15KB502 EKΩ 25X008003 CK45B1H101K C27 2531008003 CK45B1H472K C4 2531008003 CK45B1H472K C5 2531008003 CK45B1H472K C11,31,36, 38~40,50,51,60 C9,10 2533619005 CD45SL1H470J C5 2533657009 CC45SL1H271J C20 2544129005 CE04W11A70= C12,21, 35,37,49 C44 2542038004 CC4 254413000 CC1,3,5,18 2544139005 CE04W1H010= L000F S0V C1,3,5,18 2544119905 CE04W1H010= L000F S0V CHAPLE C11,3,5,18 2544119905 CE04W1H010= L000F S0V CHAPLE C11,3,5,18 2544119905 CE04W1H010= L000F S0V C11,3,5,	-					
CDS1,2 3939053001 CDS 3939053028 CDS 10~15KΩ						
RESISTOR GROUP R30				LINGTH OF (IVE)		
RESISTOR GROUP				10~15KΩ		
R30			1 000			
R30 2452195008 RN14K2E332G 3.3KΩ ½W R25 2452201002 RN14K2E562G 5.6KΩ ½W R15 2452207006 RN14K2E103G 10KΩ ½W R17 2452223006 RN14K2E473G 10KΩ ½W VR1,2 EP-5462H15 SOLID VOLUME 22KΩ VR3~5 2116000073 V08PB203 20KΩ VR6 2118024002 V16V15KB502 5KΩ CAPACITOR GROUP C33,54 2531055069 CK45B1H101K 100PF 50V C32,46 2531008003 CK45B1H102K 0.0047µF 50V C4 2531008003 CK45B1H102K 0.0047µF 50V C32,46 2531008003 CK45B1H102K 0.0047µF 50V C11,31,36,36,38~40,50,51,60 2533619005 CC45SL1H470J 0.1µF 50V C57 2533652007 CC45SL1H101K 270PF 50V C58 2533652007 CC45SL1H271J 270PF 50V C8,30,41,42	RESISTOR C	ROUP	T			
R25 2452201002 RN14K2E562G 5.6KΩ ¼W R15 2452207006 RN14K2E103G 10KΩ ¼W R17 2452223006 RN14K2E103G 10KΩ ¼W VR1,2 EP-5462H15 SOLID VOLUME 22KΩ VR3~5 2116000073 V08PB203 20KΩ VR6 2118024002 V16V15KB502 5KΩ CAPACITOR GROUP CAPACITOR GROUP CAPACITOR GROUP CC4 2531055069 CK45B1H101K 100PF 50V C32, 46 2531008003 CK45B1H102K 0.0047µF C4 2531008003 CK45B1H102K 0.0047µF C50V C11,31,36,36 2531027000 CK45F1H104Z 0.1µF 50V C50V C57 2533657009 CC45SL1H271L 47PF 50V C58 2533657009 CC45SL1H271L 270PF 50V C8,30,41,40 42,45,34 CC24 2544136001 CE04W1A470= 47µF 10V						
R15 2452207006 RN14K2E103G 10KΩ ¼W R17 2452223006 RN14K2E473G 10KΩ ¼W VR1,2 EP-5462H15 SOLID VOLUME 22KΩ VR3~5 2116000073 V08PB203 20KΩ VR6 2118024002 V16V15KB502 5KΩ CAPACITOR GROUP CAPACITOR GROUP CC44 2531005069 CK45B1H101K 100PF 50V C32, 46 2531004007 CK45B1H102K 0.0047μF 50V C4 2531008003 CK45B1H102K 0.0047μF 50V C11, 31, 36, 38~40, 50, 51, 60 2531027000 CK45F1H104Z 0.1μF 50V C57 2533657009 CC45SL1H271J 47PF 50V C58 2533662007 CC45SL1H271K 270PF 50V C20 2544129005 CE04W1A470= 47μF 10V C20 2544136001 CE04W1C101= 100μF 16V <	R30	2452195008				
R17 2452223006 RN14K2E473G 47KΩ ¼W Variable resistor VR1,2 EP-5462H15 SOLID VOLUME V08PB203 20KΩ 20KΩ 20KΩ VR6 2118024002 V16V15KB502 5KΩ 20KΩ 20KΩ CAPACITOR GROUP C33,54 2531055069 CK45B1H101K 100PF 50V 0.0047μF 50V C32,46 2531008003 CK45B1H102K 0.001μF 50V 0.0047μF 50V C11,31,36, 38~40,50, 51,60 2533619005 CK45B1H104Z 0.1μF 50V 0.047μF C57 2533657009 CC45SL1H470J 47PF 50V 100PF 50V C58 2533662007 CC45SL1H271K 270PF 50V 270PF 50V C20 2544129005 CE04W1A470= 47μF 10V 10μF 16V C8,30,41, 42,45,34 2542037005 CE04W1C101= 100μF 16V C44 2542037005 CE04W1C101= 100μF 16V 35,37,49 2542038004 CE02W1E102= 2200μF 25V C43 2542038004 CE04W1VR7= 2200μF 25V	R25	2452201002				
VR1,2	R15					
VR1,2 EP-5462H15 SOLID VOLUME VORPB203 22KΩ 20KΩ 5KΩ VR6 2118024002 V16V15KB502 5KΩ CAPACITOR GROUP C33,54 2531055069 2531008003 CK45B1H101K CK45B1H472K Ceramic 100PF 50V 0.0047μF 0.0047μF 0.0047μF 0.0047μF 0.0047μF	R17	2452223006	RN14K2E473G			
VR3~5 2116000073 V08PB203 20KΩ VR6 2118024002 V16V15KB502 5KΩ CAPACITOR GROUP C33,54 2531055069 CK45B1H101K 100PF 50V C27 2531008003 CK45B1H472K 0.0047μF 50V C32,46 2531004007 CK45B1H102K 0.001μF 50V C4 2531008003 CK45B1H472K 0.0047μF C11,31,36,38~40,50,51,60 2531027000 CK45F1H104Z 0.1μF 50V C57 2533657009 CC45SL1H470J 47PF 50V C58 2533662007 CC45SL1H271K 270PF 50V C2,53 2533637003 CC45SL1H271J 270PF 50V C8,30,41,42,45,34 2544132005 CE04W1C100= 47μF 10V C43 2542037005 CE04W1C101= 100μF 16V C43 2542038004 CE02W1E102= 2200μF 25V C41 2544044009 CE04W1H010= 1μF 50V C			COLUD VOLUME			
VR6 2118024002 V16V15KB502 5KΩ CAPACITOR GROUP C33,54 2531055069 CK45B1H101K 100PF 50V C27 2531008003 CK45B1H472K 50V 0.0047µF 50V C32,46 2531008003 CK45B1H102K 0.001µF 50V C4 2531027000 CK45B1H472K 0.0047µF 50V C11,31,36, 2531027000 CK45F1H104Z 0.1µF 50V C11,31,36, 2533619005 CD45SL1H470J 47PF 50V C57 2533657009 CC45SL1H271K 270PF 50V C58 2533662007 CC45SL1H271K 270PF 50V C20 2544129005 CE04W1A470= 47µF 10V C8,30,41, 42,45,34 CE04W1C100= 10µF 16V C43 2542037005 CE04W1C101= 100µF 16V C43 2542038004 CE02W1E222= 2200µF 25V C61 2544044009 CE04W1H010 1µF <						
CAPACITOR GROUP C33,54 C27 C2531008003 CK45B1H101K CK45B1H472K C32,46 C4 C531008003 CK45B1H102K CK45B1H472K CV45B1H472K CX45B1H472K CX45B1H470J CX45B1H104Z CX45B1H101K CX45B1H101C CX45B1H101C CX45B1H101C CX45B1H101C CX45B1H101C CX45B1H101C CX45B1H101C CX45B1H101C CX45B1H101C CX45B1H271J CX46B1H101C CX45B1H101C CX45						
C33,54 C27			V10V15RB502	J ORGE		
C33,54 C27 2531005069 CK45B1H101K CK45B1H472K C32,46 C531008003 CK45B1H102K CK45B1H472K 0.001μF 50V 0.0047μF 0.0047μF 50V 0.0047μF 0.0047μ	CAPACITOR	GROUP		r		
C27						
C32, 46 C4 C531008003 CK45B1H102K CK45B1H472K COL4F CK45B1H472K CK45B1H472K CK45B1H472K CK45B1H472K CL4F CK45B1H472K CK45B1H472K CL4F CK45B1H472K CK45B1H472K CK45B1H470J CK45F1H104Z CCC45FL1H271J CCC45FL1H271L CCC45FL1H271J CCC5FL1H271J CCC65FL1H271J CCC65FL1H271J CCC65FL1H271J CCC65FL1H271	C33,54	2531055069				
C32, 46 C4 2531004007 CK45B1H102K CK45B1H472K 0.001μF 50V 0.0047μF 50V 0.0047μF 50V 0.1μF 50V 0.0047μF 50V	C27	2531008003	CK45B1H472K			
C4 2531008003 CK45B1H472K 0.0047μF 50V 0.1μF						
C11, 31, 36, 38~40, 50, 51, 60 C9, 10 C57 C58 C2, 53 C2, 53 C2533619005 C2, 53 C20 C8, 30, 41, 42, 45, 34 C12, 21, 35, 37, 49 C44 C24 C24 C24 C24 C2544129005 C2544129005 C2542037005 C2602W1 E222= C2604W1 H010 C25440044009 C2544044009 C254401 E202W1 E202= C2604W1 H010 C2604W1 H010 C2604W1 H010 C2604W1 H010 C2604W1 H010 C2604W1 H010 Film C2604W1 H010 C2604W1	•			1		
C11, 31, 36, 38~40, 50, 51, 60 C9, 10 C57 C58 C2, 53 C2, 53 C2533619005 C245SL1H470J C2544129005 C35362707 C353637003 C244 C12, 21, 35, 37, 49 C44 C24 C24 C24 C2544140000 C1, 3, 5, 18 C2531027000 CK45F1H104Z CC45SL1H470J CC45SL1H271K CC45SL1H271K CC45SL1H271J CC45SL1H271J CC58 CE04W1A470= CE04W1C100= CE04W1C101= CE02W1E102= CE02W1E102= CE02W1E222= CE04W1VR7= CE04W1VR7= CE04W1VR7= CE04W1H010 CE04W1H010= CE04W1H	C4	2531008003	CK45B1H472K			
38~40, 50, 51, 60 C9, 10 C57 C58 C2533657009 C245SL1H470J C58 C2533662007 C245SL1H271K C20 C8, 30, 41, 42, 45, 34 C12, 21, 35, 37, 49 C44 C43 C24 C24 C24 C2544140000 C1, 3, 5, 18 C254412905 C254412905 C2604W1C101= C27 C2804W1C101= C2904W1C101= C2904W1	044 04 00	2521027000	CV45E1H1047			
51,60 C9,10 C57 C58 C58 C2533657009 C2,53 C2,53 C2533637003 C24 C20 C8,30,41, 42,45,34 C12,21, 35,37,49 C44 C43 C24 C24 C24 C24 C24 C2544140000 C1,3,5,18 C2533619005 C24 C2533657009 C245SL1H470J C45SL1H271K C264SSL1H271J C45SL1H271J C470F			CK451 1111042	011,2		
C9, 10 2533619005 CD45SL1H470J 47PF 50V C57 2533657009 CC45SL1H101K 100PF 50V C58 2533662007 CC45SL1H271K 270PF 50V C2, 53 2533637003 CC45SL1H271J 270PF 50V C20 2544129005 CE04W1A470= 47μF 10V C8, 30, 41, 42, 45, 34 2544132005 CE04W1C100= 10μF 16V 35, 37, 49 C44 2542037005 CE02W1E102= 100μF 16V C43 2542038004 CE02W1E22= 2200μF 25V C61 2544044009 CE04W1H010 1μF 50V C1, 3, 5, 18 2544119905 CE04W1H010= 1μF 50V Film 0.047 F 50V		'				
C57		2533619005	CD45SL1H470J	47PF 50V		
C58						
C2, 53 C20 C8, 30, 41, 42, 45, 34 C12, 21, 35, 37, 49 C44 C24 C24 C24 C24 C24 C2544140000 C2544140000 C1, 3, 5, 18 C2533637003 C245SL1H271J C270PF 50V Electrolitic 47μF 10V 10μF 16V 10μF 16V 10μF 16V 10μF 25V 2200μF 25V 2200μF 25V 4.7μF 35V 100μF 16V 10μF 16V				270PF 50V		
C20 2544129005 CE04W1A470= 47μ F 10V 10 μ F 16V 12544132005 CE04W1C100= 100 μ F 16V 100 μ F 100 μ F 16V 100 μ F 100 μ F 16V 100 μ F 100 100 100 μ F 100 100 100 100 100 100 100 100 100 10				270PF 50V		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$				Electrolitic		
42,45,34 C12,21, 35,37,49 C44 C43 C24 C24 C61 C1,3,5,18 C12,21, C12,2	C20	2544129005				
42,45,34 C12,21, 35,37,49 C44 C24 C24 C24 C24 C61 C61 C1,3,5,18 2544136001 CE04W1C101= 100μF 16V 100μF 16V 100μF 16V 100μF 100μF 16V 100μF 16V 100μF	C8,30,41,	2544132005	CE04W1C100=	10µF 16V		
35,37,49 C44				100 5 1511		
C44 2542037005 CE02W1E102= 1000μF 25V 2542038004 CE02W1E222= 2200μF 25V 2544140000 CE04W1VR7= 4.7μF 35V CE04W1H010 1μF 50V C1,3,5,18 2544119905 CE04W1H010= 1μF 50V Film		2544136001	CE04W1C101=	100μF 16V		
C43	35,37,49			4000 5 0511		
C24 2544140000 CE04W1VR7= 4.7μF 35V C61 2544044009 CE04W1H010 1μF 50V C1, 3, 5, 18 2544119905 CE04W1H010= 1μF 50V Film						
C61 2544044009 CE04W1H010 1μF 50V CE04W1H010= 1μF 50V Film 0.047μΕ ΕΟΥ						
C1, 3, 5, 18 2544119905 CE04W1H010= 1µF 50V Film						
Film O MATUE FOV						
000000114701 0047vE 50V	C1, 3, 5, 18	254411990	CEU4WIHUIU=			
C16 2554194017 CQ93P1H4733 U.047µF 50V			000000114701			
	C16	2554194017	CU93F1H4/33	0,04/µF 50V		

Ref. No.	Part No.	Part Name	Remarks
OTHER PA	RTS GROUP		
	2228468008	SERVO CONTRO	L
		P.C.B.	
SW1~6	2129130008	PUSH SWITCH	
	2129180003	PUSH SWITCH	POWER SW
	3998025000	CRYSTAL	4.5 MHZ
	4178028101	HEAT SINK	
	4450033005	WIRE CLAMP BA	ND

KU-420 MOTOR DRIVE UNIT

- ()	D . N	David Norman	Danada		
Ref. No.	Part No.	Part Name	Remarks		
SEMICONDU	CTOR GROUP				
IC201 2630189001 M5218L					
TR202,204	2710105002	2SA966 (Y)			
TR201,203	2730201009	2SC2236 (Y)			
H-A, H-B	2760303016	HL-300C			
TH1,2	2760311008	THERMISTER	TD5-C210D		
RESISTOR G	ROUP				
V203, 204	2116000031	VO8PB102			
V201, 202	2116000073	VO8PB203			
CAPACITOR	GROUP				
C202	2544034006	CE04W1V4R7			
C201	2544140000	CE04W1 V4R7=			
C203, 204	2551076002	CQ93M1H223K			
OTHER PARTS GROUP					
	2228477002	MOTOR DRIVE P	.C.B.		
	2050134908 IM TERMINAL PIN		N		
	2090047903	0.6 JUMPER WIR	E		

CARTONE CASE GROUP

	Ref. No.	Part No.	Part Name	Renarks
		5018228222	CARTON CASE ASS'Y	
		5028060001 5058092023	PACKING ASS'Y LAMINATE ENVELOPE	
١		5058017011	ENVELOPE	60x260xO.03
١		5058006006	ENVELOPE	60x100x O .03
l		5058023018	ENVELOPE	350×640×0.05

ACCESSORIES GROUP

Ref. No.	Part No.	Part Name	Renarks
	5298006002	45 ADAPTOR	
	4218288005	RUBBER SHEET	
	5118208003	INSTRUCTION MANUAL	E2, EA EK,
			E1,EU
	5118211003	INSTRUCTION MANUAL	EF
	5118212002	INSTRUCTION MANUAL	EG
1 1	3158547001	SHELL ACCESORIES ASS	EU
	3158752003	ALIGNMENT PLATE	
	2033667007	PLUG ADAPTOR	E1

[•] The carbon resistors rated at %W are not listed herein.



NIPPON COLUMBIA CO., LTD.

No. 14-14, 4-CHOME AKASAKA, MINATO-KU, TOKYO JAPAN TEL: 03-584-8111 TLX: JAPANOLA J22591

CABLE: NIPPON COLUMBIA TOKYO